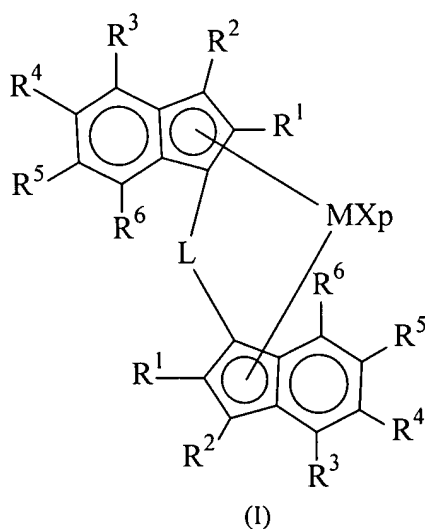


AMENDMENTS TO THE CLAIMS

1. (currently amended) A process for preparing 1-butene polymers optionally containing up to 30% by mol of derived units of ethylene, propylene or an alpha olefin of formula $\text{CH}_2=\text{CHZ}$, wherein Z is a $\text{C}_3\text{-C}_{10}$ alkyl group, comprising polymerizing 1-butene and optionally ethylene, propylene or said alpha olefin, in the presence of a catalyst system ~~obtainable~~obtained by contacting:

a) at least a metallocene compound of formula (I):



wherein:

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements;

p is an integer from 0 to 3, being equal to the formal oxidation state of the metal M minus 2;

X, equal to or different from each other, are hydrogen atoms, halogen atoms, or R, OR, OSO_2CF_3 , OCOR , SR, NR_2 or PR_2 groups, wherein R is a linear or branched, saturated or unsaturated $\text{C}_1\text{-C}_{20}$ alkyl, $\text{C}_3\text{-C}_{20}$ cycloalkyl, $\text{C}_6\text{-C}_{20}$ aryl, $\text{C}_7\text{-C}_{20}$ alkylaryl or $\text{C}_7\text{-C}_{20}$ arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements; or two X can optionally form a substituted or unsubstituted butadienyl radical or a $\text{OR}'\text{O}$ group wherein R' is a divalent radical selected from $\text{C}_1\text{-C}_{20}$ alkylidene, $\text{C}_6\text{-C}_{40}$ arylidene, $\text{C}_7\text{-C}_{40}$ alkylarylidene and $\text{C}_7\text{-C}_{40}$ arylalkylidene radicals;

R¹, equal to or different from each other, are linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing ~~one or more heteroatoms~~ at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

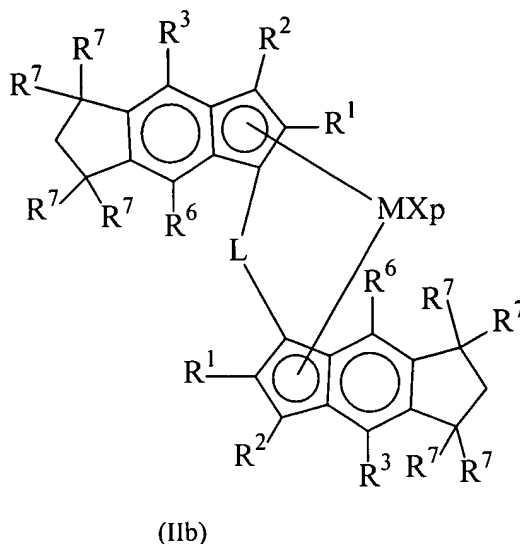
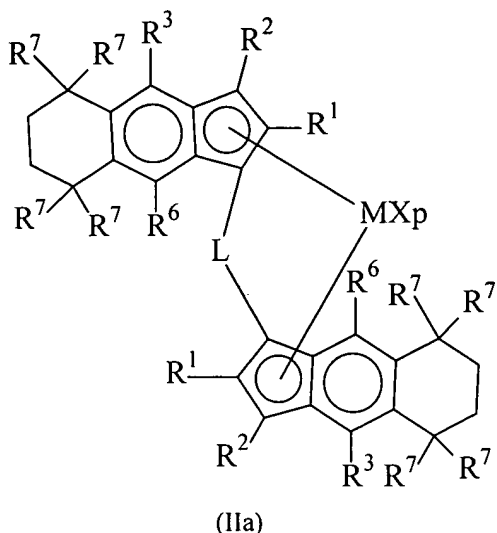
R², R³ and R⁶, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing ~~one or more heteroatoms~~ at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

R⁴ and R⁵, form together a condensed saturated or unsaturated C₃-C₇ membered ring optionally containing heteroatoms belonging to groups 13-16 of the Periodic Table of the Elements; every atom forming said ring being substituted with R⁷ radicals wherein R⁷, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing ~~one or more heteroatoms~~ at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

L is a divalent bridging group selected from C₁-C₂₀ alkylidene, C₃-C₂₀ cycloalkylidene, C₆-C₂₀ arylidene, C₇-C₂₀ alkylarylidene, or a C₇-C₂₀ arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms; and

- b) an alumoxane or a compound ~~able to form~~ that forms an alkylmetallocene cation.
2. (original) The process according to claim 1 wherein the catalyst system further comprises an organo aluminum compound.
 3. (currently amended) The process according to claim 1 ~~or 2~~, wherein in the compound of formula (I), M is titanium, zirconium or hafnium; X is a hydrogen atom, a halogen atom or a R group ~~wherein R has the same meaning as in claim 1~~ and L is Si(R⁸)₂, wherein R⁸ is a linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radical.
 4. (currently amended) The process according to ~~anyone of claims 1 to 3~~ claim 1 wherein R¹ is a C₁-C₂₀-alkyl radical; R², R³ and R⁶ are hydrogen atoms and R⁷ is a hydrogen atom or a linear or branched, saturated or unsaturated C₁-C₂₀-alkyl radical.

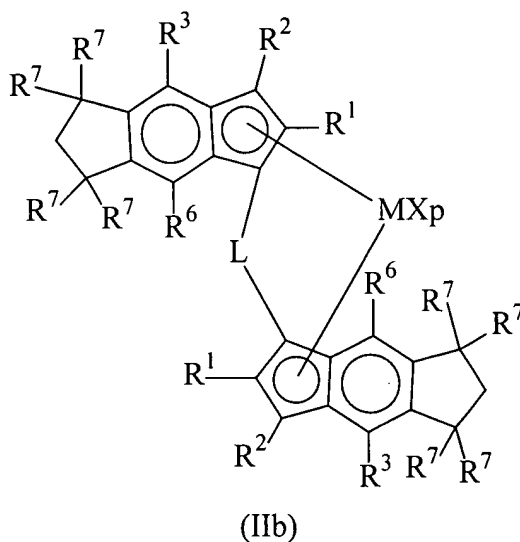
5. (currently amended) The process according to ~~anyone of claims 1 to 4~~claim 1 wherein the compound of formula (I) has formula (IIa) or (IIb):



wherein:

~~M, X, p, L, R¹, R², R³, R⁶ and R⁷ have the same meaning as in claim 1.~~

6. (currently amended) The process according to ~~anyone of claims 1 to 5~~claim 1 wherein 1-butene is homopolymerized.
7. (currently amended) A metallocene compound of formula (IIb):



wherein ~~M, p, L, R¹, R², R³, R⁶, R⁷ and X have the same meaning as in claim 1~~

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements;

p is an integer from 0 to 3, being equal to the formal oxidation state of the metal M minus

2:

L is a divalent bridging group selected from C₁-C₂₀ alkylidene, C₃-C₂₀ cycloalkylidene, C₆-C₂₀ arylidene, C₇-C₂₀ alkylarylidene, or a C₇-C₂₀ arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms;

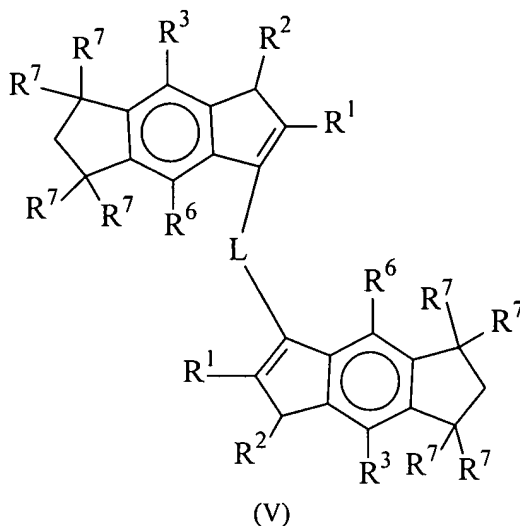
R¹, equal to or different from each other, are linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

R², R³ and R⁶, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

R⁷, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

X, equal to or different from each other, are hydrogen atoms, halogen atoms, or R, OR, OSO₂CF₃, OCOR, SR, NR₂ or PR₂ groups, wherein R is a linear or branched, saturated or unsaturated C₁-C₂₀ alkyl, C₃-C₂₀ cycloalkyl, C₆-C₂₀ aryl, C₇-C₂₀ alkylaryl or C₇-C₂₀ arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements; or two X can optionally form a substituted or unsubstituted butadienyl radical or a OR'O group wherein R' is a divalent radical selected from C₁-C₂₀ alkylidene, C₆-C₄₀ arylidene, C₇-C₄₀ alkylarylidene and C₇-C₄₀ arylalkylidene radicals.

8. (currently amended) A ligand of formula (V) or its corresponding double bond isomer:



wherein L , R^1 , R^2 , R^3 , R^6 , and R^7 have the same the same meaning as in claim 1

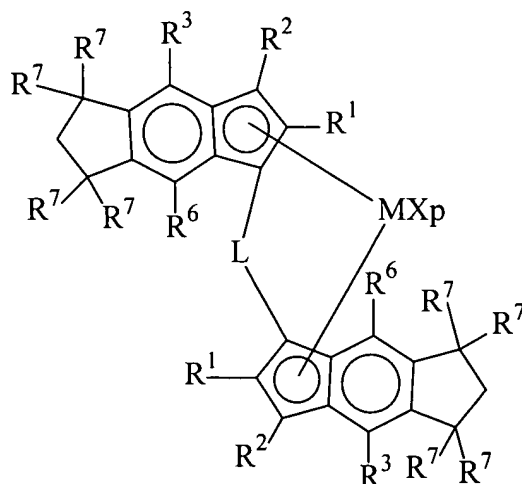
L is a divalent bridging group selected from C_1 - C_{20} alkylidene, C_3 - C_{20} cycloalkylidene, C_6 - C_{20} arylidene, C_7 - C_{20} alkylarylidene, or a C_7 - C_{20} arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms;

R^1 , equal to or different from each other, are linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

R^2 , R^3 and R^6 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements; and

R^7 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements.

9. (currently amended) A process for preparing thea metallocene compound of formula (IIb):



(IIb)

wherein M, p, L, R¹, R², R³, R⁶, R⁷ and X have the same meaning as in claim 1

M is an atom of a transition metal selected from those belonging to group 3, 4, 5, 6 or to the lanthanide or actinide groups in the Periodic Table of the Elements;

p is an integer from 0 to 3, being equal to the formal oxidation state of the metal M minus 2;

L is a divalent bridging group selected from C₁-C₂₀ alkylidene, C₃-C₂₀ cycloalkylidene, C₆-C₂₀ arylidene, C₇-C₂₀ alkylarylidene, or a C₇-C₂₀ arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms;

R¹, equal to or different from each other, are linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

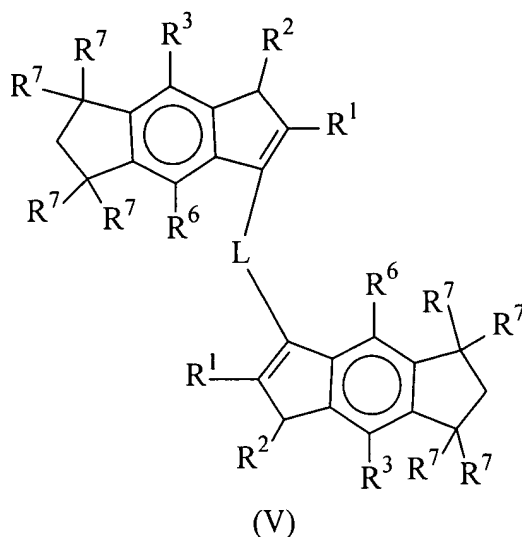
R², R³ and R⁶, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

R⁷, equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

X, equal to or different from each other, are hydrogen atoms, halogen atoms, or R, OR, OSO₂CF₃, OCOR, SR, NR₂ or PR₂ groups, wherein R is a linear or branched, saturated or unsaturated C₁-C₂₀ alkyl, C₃-C₂₀ cycloalkyl, C₆-C₂₀ aryl, C₇-C₂₀ alkylaryl or C₇-C₂₀ arylalkyl radical, optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements; or two X can optionally form a substituted or unsubstituted butadienyl radical or a OR'O group wherein R' is a divalent radical selected from C₁-C₂₀ alkylidene, C₆-C₄₀ arylidene, C₇-C₄₀ alkylarylidene and C₇-C₄₀ arylalkylidene radicals;

comprising the following steps:

a) contacting a ligand of formula (V)



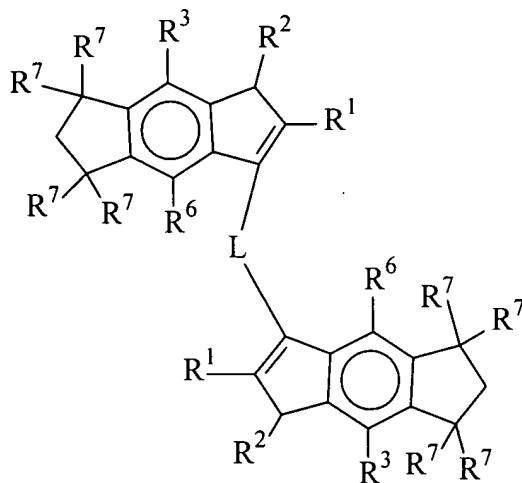
or its double bond isomer

~~wherein R¹, R², R³, R⁶, R⁷ and L have the same meaning as in claim 1~~ with a base of formula T_jB or TMgT¹, or sodium or potassium hydride, or metallic sodium or potassium; wherein B is an alkaline or alkali-earth metal and j is 1 or 2, j being equal to 1 when B is an alkaline metal, and j being equal to 2 when B is an alkali-earth metal; T is selected from the group consisting of linear or branched, saturated or unsaturated C₁-C₂₀ alkyl, C₃-C₂₀ cycloalkyl, C₆-C₂₀ aryl, C₇-C₂₀ alkylaryl or C₇-C₂₀ arylalkyl groups, optionally containing ~~one or more~~ at least one Si or Ge ~~atoms~~ atom; T¹ is a halogen atom or a group OR'' wherein R'' is a linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing ~~one or more heteroatoms~~ at least one heteroatom

belonging to groups 13-17 of the Periodic Table of the Elements; wherein the molar ratio between said base and the ligand of the formula (V) and is at least 2:1; and

- b) contacting the product obtained in step a) with a compound of formula MX_4 wherein M and X have the same meaning as in claim 1.

10. (currently amended) A process for preparing the ligand of formula (V)



(V)

or its double bond isomer

wherein R^1, R^2, R^3, R^6, R^7 and L have the same meaning as in claim 1,

L is a divalent bridging group selected from C_1 - C_{20} alkylidene, C_3 - C_{20} cycloalkylidene, C_6 - C_{20} arylidene, C_7 - C_{20} alkylarylidene, or a C_7 - C_{20} arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms;

R^1 , equal to or different from each other, are linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

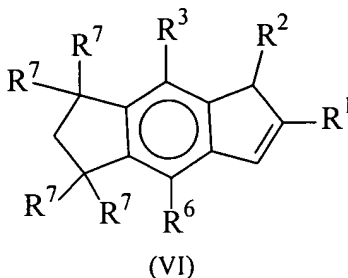
R^2, R^3 and R^6 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

R^7 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or

C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

comprising the following steps:

- a) contacting a compound of formula (VI):

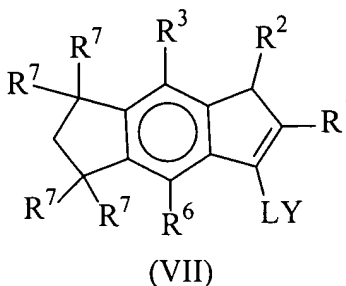


or its double bonds isomer

~~wherein: R¹, R², R³, R⁶, and R⁷ have the same the same meaning as in claim 1;~~

with a base of formula T_jB or TMgT¹, or sodium or potassium hydride, or metallic sodium or potassium; wherein B is an alkaline or alkali-earth metal and j is 1 or 2, j being equal to 1 when B is an alkaline metal, and j being equal to 2 when B is an alkali-earth metal; T is selected from the group consisting of linear or branched, saturated or unsaturated C₁-C₂₀ alkyl, C₃-C₂₀ cycloalkyl, C₆-C₂₀ aryl, C₇-C₂₀ alkylaryl or C₇-C₂₀ arylalkyl groups, optionally containing one or more Si or Ge atoms; T¹ is a halogen atom or a group OR'' wherein R'' is a linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing one or more heteroatoms at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements; wherein the molar ratio of said base and the compound of the formula (VI) is at least 1:1;

- b) contacting ~~the obtained~~ anionic compounds obtained in step a) with a compound of formula (VII):

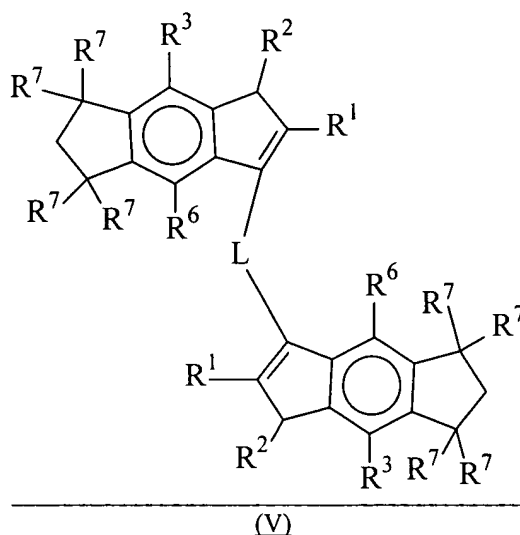


or its double bonds isomer

wherein R^1, R^2, R^3, R^6, R^7 and L have the same the same meaning as in claim 1 and

Y is a halogen radical selected from the group consisting of chloride, bromide and iodide.

11. (currently amended) A process for preparing thea ligand of formula (V): when



or its double bond isomer

wherein

L is a divalent bridging group selected from C_1 - C_{20} alkylidene, C_3 - C_{20} cycloalkylidene, C_6 - C_{20} arylidene, C_7 - C_{20} alkylarylidene, or a C_7 - C_{20} arylalkylidene radical optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, or a silylidene radical containing up to 5 silicon atoms;

R^1 , equal to or different from each other, are linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

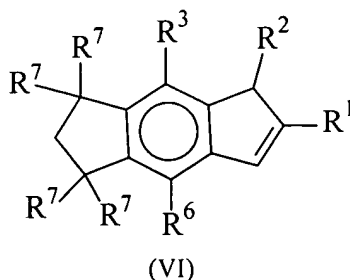
R^2, R^3 and R^6 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or C_7 - C_{20} -arylalkyl radicals, optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

R^7 , equal to or different from each other, are hydrogen atoms or linear or branched, saturated or unsaturated C_1 - C_{20} -alkyl, C_3 - C_{20} -cycloalkyl, C_6 - C_{20} -aryl, C_7 - C_{20} -alkylaryl or

C₇-C₂₀-arylalkyl radicals, optionally containing at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements;

wherein the substituents R¹, R², R³, R⁶ and R⁷ are the same in both the indenyl moieties, comprising the following steps:

- a) contacting a compound of formula (VI):



or its double bonds isomer

~~wherein: R¹, R², R³, R⁶ and R⁷ have the same the same meaning as in claim 1;~~ with a base of formula T_jB or TMgT¹, or sodium or potassium hydride, or metallic sodium or potassium; wherein B is an alkaline or alkali-earth metal and j is 1 or 2, j being equal to 1 when B is an alkaline metal, and j being equal to 2 when B is an alkali-earth metal; T is selected from the group consisting of linear or branched, saturated or unsaturated C₁-C₂₀ alkyl, C₃-C₂₀ cycloalkyl, C₆-C₂₀ aryl, C₇-C₂₀ alkylaryl or C₇-C₂₀ arylalkyl groups, optionally containing ~~one or more~~ at least one Si or Ge atoms; T¹ is a halogen atom or a group OR'' wherein R'' is a linear or branched, saturated or unsaturated C₁-C₂₀-alkyl, C₃-C₂₀-cycloalkyl, C₆-C₂₀-aryl, C₇-C₂₀-alkylaryl or C₇-C₂₀-arylalkyl radicals, optionally containing ~~one or more heteroatoms~~ at least one heteroatom belonging to groups 13-17 of the Periodic Table of the Elements; wherein the molar ratio between said base and the compound of the formula (VI) is at least 1:1;

- b) reacting ~~the~~ product obtained in step a) with a compound of formula YLY, wherein ~~L and Y have the same the same meaning as in claim 9~~ is a halogen radical selected from the group consisting of chloride, bromide and iodide and wherein ~~the~~ molar ratio between the compound obtained in step a) and the compound of formula YLY is at least 2:1.